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WESTERN STATES MINERALS CORPORATION

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June 2, 1994

Ms. Pamela Grubaugh-Littig
Permit Supervisor
State of Utah
Division of Oil, Gas and Mining
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

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RE; MODIFICATIONS TO THE J.B. KING MINE RECLAMATION PLAN REVISION (SUBMITTED FEBRUARY 18, 1994), WESTERN STATES MINERALS CORPORATION, J.B. KING MINE, ACT/015/002, FOLDER #2, EMERY CO., UTAH - AND PROPOSED SAMPLING PROTOCOL FOR SUMMER 1994

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Dear Ms. Grubaugh-Littig:

Please find attached the following two (2) documents:

1. Modifications to the J.B. King Mine Reclamation Plan Revision, dated February 18, 1994. This includes seven (7) replacement pages to address issues from the Division's letter of April 14, 1994 (and specifically to Susan White's letter of March 10, 1994) regarding terminology related to stability, surface preparation, and standards on the reconfigured portions of the site.

2. This second document outlines the proposed sampling protocol that will be utilized this summer to sample vegetation patterns in relation to topography and other regional and site specific factors. This should be forwarded to Susan White.

250 S. Rock Blvd., Suite 130 ▲ Reno, NV 89502 ▲ (702) 856-3339 ▲ FAX (702) 856-1818

Field vegetation sampling will commence the week of June 6, 1994. Of course, Division staff are welcome to participate in this activity. Dr. Sam Bamberg will be directing this program.

As other information becomes available, I will continue to forward it to your attention. If you have any questions, please call me at your earliest convenience.

Sincerely,

E.M. (Buzz) Gerick

cc: Lowell Braxton (UDOGM)
Larry Berg
Sam Bamberg

PROPOSED SAMPLING PROTOCOL AT THE J.B. KING MINE SITE EMERY COUNTY, UTAH

SUMMER 1994

Submitted to:
WESTERN STATES MINERALS CORPORATION
205 S. Rock Blvd., Suite 130
Reno, Nevada 89502

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May 1994

1.0 Introduction

This sampling protocol has been developed for the sampling vegetation patterns in relationship to topographic, soils, and erosional factors. The present reference area does not address the pattern of vegetation and size allowance for bare versus vegetated areas. The topography and soils on the reclaimed site are complex and disturbed, and the vegetation established is in a successional status and not uniform. We are proposing to conduct a specific type of sampling for determining the relationship of vegetation patterns to soils and topography on undisturbed natural areas in the vicinity of the mine site. The purpose of this sampling is to determine the natural patterns of vegetation in this specific region of Utah as a guide to conditions to be expected on the reclaimed site. These types of field analysis are not a part of ordinary procedures covered in the Division's guidelines.

The method proposed uses linear coupled transects. These are linear plots (typically 2 x 10 meters in size) laid end to end along a straight compass line and oriented parallel to the gradient. The general areas to be surveyed will be the westerly facing escarpments and slopes of Dog Valley. Vegetative, topographic, erosional, and soil parameters will be recorded in each plot. The transects will be analyzed for the type of vegetation and size of bare areas as they relate to topography, soils, and erosional features.

These procedures may change somewhat as the field program is started and field tested. All changes to these procedures will be documented, and an explanation and rationale for the change included in the report produced. A general field reconnaissance will be conducted in the vicinity of the reclaimed mine to observe and record topographic, drainage conditions, and other environmental factors. The downslope and drainage features in the basin in which the reclaimed mine is located will be characterized and photographed.

2.0 Specific Procedures

The procedures are detailed in this section for the parameters to be measured, the sampling locations and marking, number of samples, and analysis of the data.

Sampling location and marking: Two sets of sampling will be conducted; one off site, and the other on site. The off site linear transects will be run north and south from numbered perimeter fence posts chosen randomly. The transects will be run from these random points on the north edge of the site in a northerly direction (specific azimuth) along gradients at the same elevation as the site. This may be repeated running south from the southern edge of the site if more samples are required. The general areas to be surveyed will be the westerly facing escarpments and slopes of Dog Valley. Transects will be permanently marked with 3' lengths of #3 rebar driven 2.5' into the ground at every 30 meters. A 30 meter steel tape will be stretched between markers. Similar linear transects will be measured on the reclaimed site using the same systematic random location method. An attempt will be made to have approximately the same number of samples on and off site.

Parameters: The parameters in the transects to be measured for vegetation are: percent cover by species, numbers of shrubs by species, and length of the center line that is vegetated. Topographic features recorded will be slope and aspect; soils and surface features will be types of substrate and percentage rock; and erosion features will be depths and width of drainages (gullies and rills), and amounts of aggradation and degradation (erosional status) of surfaces.

Specific field forms have been developed which will be used during the field measurements. This form will be transferred to computer spreadsheets for general analysis and statistical tests. A sample of the form is attached to this protocol which details the field measurement for each parameter. The following are the measurements for each parameter that will be measured in the

field:

PARAMETER	FIELD MEASUREMENTS
Vegetation	species cover
	total cover
	shrub density
	length of center line that is vegetated (1% cover or more)
Topography	percent slope
	aspect
Soil type	a descriptive term that will be developed in the field by inspection
Substrate type	a descriptive term to be developed
Rock	type
	percent cover
Moisture	a scaler of 1 (moist) to 5 (dry)
Erosion	a scaler of 1 (severe erosion) to 5 (obvious deposition)

Number of samples: The number of samples will depend on the heterogeneity of the linear plots being surveyed. Sample adequacy for the number of factors being measured is not of concern, but a large number of samples is required for multiple regression analysis. At the present time, the number of samples planned is 200 of the linear plots on 2 or 3 lines off site, and 100 to 150 plots on site.

Analysis: The results of the transects will be analyzed for: (1) the vegetative types, percentage cover, and sizes of area with low vegetative cover; (2) the percentage and types of topographic slopes; (3) the percentage and types of soil; and (4) types and amounts of erosional features. The parameters will be developed using statistical means and standard deviations. The correlation coefficients between these four sets of parameters will be determined using multiple regression analysis.

These results will then be applied to conditions on the site with similar parameters. The variable on site will be compared to the similar variable off site using the *t* distribution, or a comparable non-parametric statistical test, if appropriate. The results of the analysis will be applied as criteria for the allowable size and percentage of areas with low vegetative cover as related to topography and soils. The statistical analysis may be further developed after the field work this summer.

3.0 Reporting

The results of the field sampling procedures will be documented in a report. The report will include all methods used and any modifications necessitated by field sampling or statistical analysis. The recommendations will include any modifications to the planned revised reclamation (J.B. King Mine, Reclamation Plan Revision, February 1994) on the site this fall.

J.B. KING MINE
RECLAMATION PLAN REVISION

1994 APPENDIX TO
PERMIT ACT/015/002

February 1994
May 1994 (Revision)

February 18, 1994 (Revised May 1994)

of the reclaimed refuse area, was installed during reclamation at the request of the Division (UMC 817.111-.117 Revegetation supplement submitted July 1, 1985; Test Plot Area - Revegetation of Refuse Pile). This test plot incorporates varying depths of topsoil (0 to 4 feet), and three different fertilizer application rates. This test plot has been monitored by the Division, and it is slated to be covered with soil and revegetated during 1994 by WSMC.

The fifth and final phase of reclamation performed during the first week of April 1986 consisted of the planting of 5,000 seedlings (UMC 783.19 and 817.111-.117) and the construction of 2700 feet of perimeter fence (UMC 784.13).

Post reclamation monitoring was conducted on a monthly basis during the first year after reclamation was completed and quarterly thereafter. The sedimentation pond has never overflowed even during 1992 and 1993 when precipitation was above average. There has been no contribution of suspended solids to runoff outside of the reclaimed area. Post reclamation concerns have consisted primarily of erosion control and vegetative cover onsite. The site has been periodically monitored for revegetation cover, density, and general site conditions as required by the permit (UMC 784.13(b)(5)(vi)). In addition, during the summers of 1991 to 1993 the site was monitored for vegetation cover and density for trend analysis during years with no monitoring requirements.

Erosion (UMC 817.45 and 817.106)

The main diversion channel and the feeder ditch were originally designed to be unarmored with gently sloping revegetated banks. The design did not allow for the intensity of the rainfall events nor the relatively low vegetative cover common to this region. This resulted in excessive erosion of the feeder channel and the upper reaches of the main channel. In May 1987, rip rap was installed in the eroded channel areas. However, in late 1987 the rip rap also eroded due to intense storm activity that exceeded design criteria. In June 1988, the channels were again recontoured and the rip rap reinstalled. The check dams in the feeder ditch were also reinstalled. During severe storms in 1989, these installations failed and were repaired. They failed again in 1991. The Division issued NOV's subsequent to these failures, citing failure to meet design criteria.

A second area of erosional concern has been the west and southwest facing slopes of the refuse pile. Contour furrows in combination with straw bales and silt fences were initially used to control erosion. In late summer, 1986, the contour furrows filled with sediment and breached after the occurrence of several major storm events. This resulted in rilling along most of the slope area. The larger rills have been periodically filled with rock anchored straw, or controlled with additional silt fences. The rills and gullies do not interfere with the post-mining land use, and they have developed some natural rock armoring. The silt fences were removed during the summer of 1993, since their purpose for controlling sediment runoff during the early stages of revegetation was complete.

Revegetation (UMC 783.19)

Revegetation on the site has generally resulted in a vegetative cover and density that is comparable to the reference area, and other vegetation in the vicinity of the site. The west and southwest facing slopes of the reclaimed refuse area have been the most difficult area of the site to revegetate. This is due to a combination of the southern exposure, early unauthorized cattle grazing, poor soil conditions, and low precipitation from 1988-1990. In 1989, a grazing permit was secured

from the state of Utah, and the perimeter fence was completely rebuilt, and sections added. A road was relocated outside of the reclaimed area in order to control vehicle entry and to prevent cattle trespass. The road on the site and some of the areas which were traversed by heavy equipment during channel rebuilding (comprising approximately two acres) were ripped, reseeded, and mulched in mid-October 1989.

2.2 Present Revegetation Conditions and Trends (UMC 783.19, 817.111, and 817.116)

The general condition and phenology of the vegetation on site has improved due to abundant precipitation during 1991 to 1993. Plant species cover has increased from 1989, and some shrubs and grasses have germinated to produce numerous seedlings. Grasses and shrubs have increased in size and cover. The plant cover on the reclaimed site is comparable to the region, and this year's (1993) increased growth was proportional to the reference area. The general trend in vegetation on the site has been a gradual increase in shrub density, also an increase of plant species of desirable forage quality with a simultaneous decrease in weedy species. There has also been a general increase in total plant cover of desirable plants (from 13% in 1989 to 25% in 1993). The reclaimed site does not have the same dominant species as the natural vegetation, but the species present provide good cover and quality habitat for animals. The reclaimed site has become a functional ecosystem with a diverse assemblage of plants and animals, and habitats in good condition. Due to the vegetation seeded and planted during reclamation, the J.B. King mine site contains more desirable vegetation for grazing than the surrounding areas, which has been heavily utilized as winter pasture for many years.

The perimeter fences surrounding the reclaimed site are in good condition and are being maintained on a continuous basis by a local contractor. The erosion control features including the catch pond, and rills filled with straw and rock are intact and operating. Erosion has not been excessive during the past two years of greater precipitation. Soil surfaces have developed armor plating with residual rock and compaction through natural processes. There has been no quantative or objective measure of erosional stability. The silt fences have been removed since their function of catching sediment during the early mine reclamation is no longer needed. The site is continuing to be monitored and maintained to promote revegetation and erosion control. Grazing rights to the site were obtained by WSMC through 1999 to exclude cattle. Vegetation and general site conditions were monitored during 1989, 1991, 1992, and 1993, and show a positive progressive trend in reclamation results.

Monitoring during 1993 showed that four-wing saltbush (*Atriplex canescens*) was the most abundant woody plant species measured in the sample plots at 45% of the total number of shrubs, and an average density of 1304 shrubs per acre. Shadscale (*Atriplex confertifolia*) was the second most abundant with a density of 22% of the total and 632 shrubs per acre. Winterfat (*Ceratoides lanata*) and greasewood (*Sarcobatus vermiculatus*) each were 11% of the total with 328 and 320 shrubs per acre respectively. Rubber rabbitbrush (*Chrysothamnus nauseosus*) was the last shrub species with a significant density at 9% of the total and 272 shrubs per acre.

During 1993, the average percent cover of all monitored plots for shrubs, grasses, and forbs was 17.2, 6.8 and 0.9 respectively, for an average desirable vegetative cover of 24.9%. Weeds

The amounts of soil materials removed from the ditch and their placement on the site will be determined based on results of the soil sampling analysis. The purpose of this sampling is to collect geotechnical information in the vicinity of the ditch alignment, and to analyze for parameters important in determining their suitability for use in the revegetation program. This excavated material will be segregated and suitable soil substrate will be used to cover the revegetation test plots. See Section 7.2 for additional details on soil testing and handling.

Those areas around the drainage ditch to be revegetated will be roughened and seeded with the approved seed mix, augmented, if possible, with collections of native seed from the area. See Sections 7.4 and 7.5 for details on recommend-ed soil amendments and seed mix.

7.1.2 Revegetation Test Plot (UMC 817.111)

The revegetation test plot on top of the refuse pile has varying amounts of soil covering the coal refuse. See Permit Section 817.111 - Revegetation Supplement Dated July 1, 1985 - showing schematic of test plot in Figure on page 3. The test plot is approximately 100 feet wide and 435 feet long. The present area is mostly flat, with a slight slope to the west and north. The plot was segmented into four linear sections, each 25 feet wide by 435 feet long, with depths of soil cover at 0" (on the east, next to the perimeter ditch), 6", 12", and 24" (on the west, leading into the slope of the refuse pile). The purposes of the proposed alteration to the test plots are to cover exposed coal refuse, and to provide a suitable substrate for revegetation.

The proposed procedures for this test plot are:

1. Maintain the surface of the plot in its mostly flat topographic form to prevent runoff and erosion (See Figure JBK-10 for a cross section of the altered test plot).
2. Cover all segments of the test plot with a minimum of 24" of soil. That is, add the total 24" to the exposed coal refuse segment, add 18" additional soil to the current 6" depth, and add 12" additional soil to the current 12" depth. Suitable soil will be transported from the excavation of the newly proposed drainage ditches.
3. Grade the surface of the covered test plot into a roughened surface to enhance water availability for revegetation, and tie into the surface configuration of the western faces of the refuse pile (see Drawing No. JBK-3).
4. Amend the soil with sewage sludge and seed the area immediately with the recommended seed mix.

The excess soil placed on the south shaley area will be roughened and amended with organic matter mixed into the surface layer, before sowing with the recommended seed mix as described above. The surface will be either be protected with a straw mulch at a rate of approximately 3000 pounds per acre or the application of straw with cattle penning (see Section 7.4). If the soil from the excavated drainage ditches is not suitable, an alternative source of soil or cover material could be the rock mulch used on the slopes of the refuse pile.

7.1.3 Access Road and Transport Corridors (UMC 817.111)

These transport areas will generally be linear and no more that 10 feet wide. The compacted surface will be ripped and roughened prior to mulching and seeding. Roads susceptible to erosional rills will be left with a rough surface. Straw mulch will be crimped into the loose soil surface.

7.1.4 Sloped Surfaces of the Refuse Pile (UMC 817.45, 817.105, and 817.111)

Slopes on the portions of the refuse pile are potentially erodible due to the low vegetative cover, and the placement of soil into smooth and compacted slopes. Vegetation on this slope will not control erosion given the arid climate, severe thunderstorms, and lack of mature drainage patterns. In order to control erosion, this surface will be roughened and covered with a rock mulch. The main purpose of these activities is slope stabilization and erosion control. The present vegetative cover, about 10%, will be destroyed by the roughening procedures and application of the rock mulch. See Section 4.0 for a discussion of vegetation performance standards for this section of the reclaimed site.

Details of the proposed activities on the slopes are as follows:

1. The slope of the refuse pile will be regraded to form a roughened surface (shown on Map JBK-3 for location). The roughened surface with elevation differences of approximately 12" will be formed along and across the slope in an irregular manner to simulate natural patterns. These will be field determined at the time of construction.
2. A minimum of 4" layer of rock mulch will be applied to the entire freshly disturbed surface. See Section 7.2.1 for a discussion of the source and nature of the rock mulch. The rock mulch will be mixed with sewage sludge, if available, to improve water holding capacity. The rock mulch surface will then be left roughened to insure water availability for vegetative growth.
3. The areas will be seeded immediately with the approved mix augmented with seed collected locally from native plants, if available. See Section 7.5 for a discussion of seed sources to be used. Penned and fed cattle may be used to fix straw into this surface, but stray application on the rock mulched side slopes is not required.

7.1.5 Staging Area and South Shaley Area (UMC 817.21, 817.24, and 817.25)

The proposed staging area and south shaley area (which was initially a substitute topsoil borrow area when the site was reclaimed in 1985) is located to the west of the proposed channel construction in the flat area below the southwest escarpment. This area will be disturbed by equipment staging, soil segregation and handling activities, and by placement of excess soil materials excavated during channel construction. At the end of these activities this area will need to be reclaimed.

Reclamation activities during construction will consist of segregation of the soils by: (1) placing soils determined to be unsuitable along the base of the escarpment (the former borrow area), (2) using suitable soils mixed with sludge to first cover the test plots on top of the refuse pile, and (3) then use the remainder to cover the unsuitable soils placed against the escarpment with a minimum of 2 feet. After construction activities cease, the surface of these areas will be contoured, roughened or ripped, and seeded. Straw mulch will be applied to enhance germination, or penned cattle may be used to fix straw mulch.

on the soil fertility. The use of sewage sludge will depend on finding a source close to the site and the ability to obtain a permit. Work on this is proceeding, and a potential source has been located from the city of Moab P.O.T.W. The rate of sludge application is being recommended in a range of 12 to 18 tons per acre.

Chemical fertilizer is not recommended for use as a soil amendment. The use of chemical fertilizer can promote weed growth that would compete with the native and desirable plants. Chemical fertilizer may increase salts in soils already high in salts. Also, the nutrient standards for the native vegetation is not known. An inappropriate nutrient addition will not help, and may even hinder, native plant germination and growth.

The procedures for using penned cattle for applying organic mulch is as follows:

1. Enclosed the area to be mulched with an electric fence.
2. Release cattle at the rate of about 15 to 25 per acre into the enclosure.
3. Provide excess feed hay (and water) evenly distributed on the ground.
4. Keep cattle on the area for about a week or until the ground is evenly covered with mulch.

This procedure has the advantage of evenly distributing a high quality mulch and creating pocket for seed germination.

7.5 **Revegetation Activities** (UMC 817.111 to UMC 817.117)

The revegetation activities include the proposed seed mix to be used, methods of acquiring seed and sources, and the application rates of seeding.

7.5.1 **Seed Mix** (UMC 817.100 and 817.112)

All reasonable attempts to use local native seeds for revegetation will be made. Local seed collection companies will be contacted for availability of native species for use in the seed mix. Also, WSMC will collect native seed along the Dog Valley escarpment of those plants which are desirable for revegetation on the site. Adapted varieties will be used where possible. Collection will depend on sufficient seed being set during the 1994 growing season.

The recommended seed mix has been adjusted based on the monitoring results of the past four years for growth of plant species in the original seed mixture. Some species that were planted did not germinate or grow, such as joint fir, blue grama and big bluestem, and these plants will not be seeded again. Table 7.1 gives the presently recommended seed mix. This mix may be adjusted depending on availability of seed from seed collection companies and from the Dog Valley native plant population seeds.

4.0). There are outcrops of sandstone, shaley parent materials, alluvial flats, colluvial slopes, and coal seams that have similar sparse, low, or absent vegetative cover.

Twelve random samples were taken in the specific area north of the refuse pile during the 1993 site vegetation monitoring. The average desirable plant cover was 22.8% with 4 species of shrubs, 12 species of grasses, 3 species of forbs, and 3 species of weeds (not included in plant cover). This area as a whole does meet required revegetation standards and has cover similar to the site as a whole. However, localized areas of less than standard cover do exist. A composited soil sample from this particular area on the reclaimed site was analyzed for soil parameters and did not identify any specific soil problems. The soil was heterogeneous and similar to the rest of the site. The soil surface layers were probably removed during reclamation for borrow material since the soil surface lacks a organic surface layer, and the unweathered substrate materials were exposed at the surface in places.

The procedures given in Section 8.0 will establish criteria for what area needs increased vegetative cover based on natural conditions around the site for vegetative patterns and sizes of areas with little plant cover. The soil conditions can be observed onsite at the time of the corrective actions, and field determined as to the appropriate enhancements to use. The areas can be selectively enhanced using sewage sludge as a soil amendment to improve water holding capacity, and hand tools as described in Section 7.4. This is a long-term and better solution than attempting to selective rip and reseed small areas in an otherwise well revegetated area. This will be performed using accepted husbandry practices for the region.

8.0 PROPOSED ADDITIONAL METHODS FOR DETERMINING RECLAMATION STANDARDS (UMC 817.116)

The present reference area does not address two revegetation criteria raised as concerns by the Division at the JB King mine site. The present single reference area can be used for vegetative cover, shrub density, and productivity standards on the site. However, the first criteria not addressed is the pattern of vegetation and size allowance for bare versus vegetated areas. The topography and soils on the reclaimed site are complex and disturbed, and the vegetation established is not uniform. The second concern is the development of an appropriate revegetation standard for the slopes of the refuse pile which will be covered with rock mulch for erosion control. There will be a large percentage of rock on the surface to control rain splash and erosion, this will impact the vegetation that can be established. The amount of suitable soil surface for vegetation will be drastically reduced. There are no areas on the site or in the vicinity that will have this type of surface for use as a reference.

For the first additional criteria, WSMC is proposing to conduct a specific type of sampling for determining the relationship of vegetation patterns to soils and topography on undisturbed natural areas in the vicinity of the mine site. This method uses linear coupled transects, which are linear plots (typically 2 x 10 meters in size) laid end to end along a straight compass line and oriented parallel to the gradient. The transects will be run from from random points on the north edge of the site in a northerly direction (specific azimuth) along gradients at the same elevation as the site. This will be repeated running south from the southern edge of the site. The general areas to be surveyed will be the westerly facing escarpments and slopes of Dog Valley. Vegetative, topographic,

erosional, and soil parameters will be recorded in each plot. The transects will be analyzed for the type of vegetation and size of bare areas as they relate to topography, soils, and erosional features.

The parameters in the transects to be measured for vegetation are: percent cover by species, numbers of shrubs by species, and length of the center line that is vegetated. Topographic features recorded will be slope and aspect; soils features will be types of substrate and percentage rock; and erosion features will be depths and width of drainages (gullies and rills), and depths of aggradation and degradation of surfaces. Transects will be permanently marked with 3' lengths of #3 rebar driven 2.5' into the ground. Similar linear transects will be measured on the reclaimed site using the same systematic random location method.

The results of the transects will be analyzed for: (1) the vegetative types, percentage cover, and sizes of area with low vegetative cover; (2) the percentage and types of topographic slopes; (3) the percentage and types of soil; and (4) types and amounts of erosional features. The correlations between these four sets of parameters will be determined using multiple regression analysis, and the results applied to conditions on the site with similar parameters. They will be applied specifically as criteria for the allowable size and percentage of areas with low vegetative cover in relationship to topography and soils. The field procedures and statistical analyis will be developed as a sampling protocol before starting the field work this summer.

WSMC is not proposing a revegetation standard for the rock mulched slope of the refuse pile since the Division's Vegetation Information Guidelines does not accept technical standards for revegetation success. The rock mulch slopes will not be monitored for vegetation success nor will any standard be applied. The principal purpose for the rock mulch is control erosion, and not revegetate the slopes. The rock mulch slope will be seeded and treated with organic sludge, if available.

WSMC is not proposing a vegetation standard for the coal refuse revegetation test plots covered with soil. This area is the responsibility of the Division, and the standard will be the same as the rest of the area (consistent with UMC 817.111-.117 Revegetation supplement submitted July 1, 1985; Test Plot Area - Revegetation of Refuse Pile, Paragraph 2).